SINUS ANATOMY AND PATHOLOGY*

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THE principal radiographic manifestation of sinus disease is clouding or opacification of the sinus. The radiographic differential diagnosis between opacification of the sinus produced by the usual type of bacterial or allergic sinusitis and a tumor is the presence of bone destruction. Therefore, any time an opacified sinus is noted, its walls should be examined carefully on the routine films for evidence of bone destruction. Tomograms of the paranasal sinuses may be necessary to confirm or to exclude the presence of bone destruction suspected from the routine film appearance. It is very unusual for bacterial or allergic sinusitis to produce bone destruction of the affected sinus. If there is evidence of bone destruction, conservative therapy for sinus disease is not adequate and a biopsy must be obtained from the lesion.

AREAS OF SEARCH FOR BONE DESTRUCTION

The areas of search for bone destruction depend upon which sinus is opacified. When the maxillary sinus is opacified, the following structures should be examined carefully for evidence of bone destruction: the lateral wall and medial wall of the maxillary sinus, the ethmomaxillary plate (the thin plate of bone separating the ethmoid sinus from the maxillary sinus), the roof of the maxillary sinus (the floor of the orbit), and the maxillary alveolar process. When the ethmoid sinus is clouded, the lamina papyracea (the medical wall of the orbit) and the ethmomaxillary plate should be scrutinized for evidence of bone destruction.

Bone destruction originating from the frontal sinus usually involves the adjacent roof of the orbit or the bony cortex of the margins of the affected sinus. Bone destruction from sphenoid sinus tumors affect the cortical margins of the sinus or the margins of the sella turcica. Intrasinus tumors

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are notoriously silent, and therefore radiographic diagnosis is extremely important.

Maxillary sinus destruction: lateral wall. Destruction of the lateral wall of the maxillary sinus is best visualized in the Waters view. On the Waters view the zygomatic arch and the lateral wall of the maxillary sinus down to the maxillary alveolar ridge should make a continuous smooth curve. A discontinuous or interrupted curve suggests the probability of bone destruction.

Maxillary sinus destruction: medial wall. Destruction of the medial wall of the maxillary sinus is more difficult to appreciate than is destruction of the lateral wall. Even extensive destruction of the medial wall will produce only minimal changes in its radiographic appearance. This is so because the medial wall of the maxillary sinus is a plate of bone about 5 cm. in length tangential to the x-ray beam. Thus, as much as 3 to 4 cm. of bone destruction can leave enough intact bone remaining to produce a medial wall contour on the roentgenogram. Therefore, bone destruction of the medial wall of the maxillary sinus manifests itself radiographically, not as a lytic area or as frank interruption of the contour, but rather as a difference between the two medial walls.

The medial wall of a maxillary sinus with bone destruction appears thinner and less distinct than the normal wall. A slight difference in appearance between the medial walls of the maxillary sinuses on a routine film is an indication to obtain tomograms of the paranasal sinuses to rule out bone destruction. The medial wall of the maxillary sinus is seen on both the Caldwell and the Waters view. However, a different portion of the wall is seen on each view. The medial wall of the maxillary sinus is seen more en face; thus, the anterior and posterior portions are superimposed on each other. If the medial wall appears abnormal on either projection, tomography of the paranasal sinuses is indicated.

Maxillary sinus destruction: ethmomaxillary plate. The ethmomaxillary plate is best seen on the Caldwell view, and is a thin, curvilinear plate of bone separating the maxillary sinus from the ethmoid sinuses. Nonvisualization of this structure accompanying an opacified maxillary antrum suggests not only bone destruction but extension of the process from the maxillary sinus into the ethmoids. Nonvisualization of the ethmomaxillary plate calls for tomography of the paranasal sinuses.

Maxillary sinus destruction: roof, anterior portion. The anterior portion of the roof of the maxillary sinus is seen best on the Waters view. If

bone destruction involves this portion of the roof of the sinus, it will appear thinner and less distinct than the roof of the maxillary sinus on the opposite side. Just as with the medial wall of the maxillary antrum, it is unusual to see frank interruption of the line produced by the anterior portion of the roof of the maxillary sinus when bone destruction is present.

Maxillary sinus destruction: roof, posterior portion. The posterior portion of the roof of the maxillary sinus can be seen on the Caldwell and Towne projections. On the Waters projection, the head is extended so that all anterior structures are thrown upward. The most superior line of the roof of the maxillary antrum is the most anterior portion of the floor as seen on the Waters. On the Caldwell view, the posterior portion of the roof of the maxillary sinus is the most superior line representing the roof of the sinus.

Destruction of the extreme posterior portion of the roof of the maxillary sinus is seen best on the Towne view. This is the part of the roof of the maxillary antrum adjacent to the inferior orbital fissure, and this portion of the maxillary sinus roof is at the junction of the roof with the postero-lateral wall of the sinus.

Maxillary sinus destruction: alveolar ridge. The maxillary alveolar ridge is best seen on the Waters view, but it can also be seen on the Caldwell. The alveolar ridge should be carefully evaluated on both views. Destruction of the maxillary alveolar ridge is usually seen best on the Waters view.

Ethmoid sinus bone destruction. Bone destruction produced by an ethmoid sinus lesion will be seen in the ethmomaxillary plate or in the lamina papyracea (medial wall of the orbit).

The lamina papyracea is seen on the Caldwell and the Waters views. However, different portions of the lamina papyracea are seen on each view. Because anterior structures are displaced upward on the Waters film, the lamina papyracea seen on the Waters is the anterior portion. On the Caldwell view, the anterior portion is not well visualized because it is superimposed on the posterior ethmoid air cells. That portion of the lamina papyracea seen best on the Caldwell view is the posterior portion. Thus, the medial wall of the orbit can appear normal in the Caldwell view but can still appear destroyed in the Waters view or vice versa because each view demonstrates a different portion of the lamina papyracea. Therefore, the medial wall of the orbit must be carefully evaluated both in

the Caldwell and in the Waters views before one can conclude that the lamina papyracea is intact. If the lamina papyracea appears to be destroyed in the Waters view, destruction involves the anterior portion of the lamina papyracea. If the lamina papyracea appears destroyed on the Caldwell view, the posterior portion of the lamina papyracea is affected.

Frontal sinus bone destruction. The frontal sinus is best seen on the Caldwell view. If the frontal sinus is opacified, bone destruction should be searched for along the margins of the sinus and the superomedial border of the orbit. The superomedial border of the orbit is seen well only in the Caldwell view. It is usually indistinct and therefore cannot be evaluated in the Waters view.

Sphenoid sinus bone destruction. Opacification of the sphenoid sinus is best seen in the base view. Bone destruction from a sphenoid sinus tumor usually manifests itself by destroying the cortical lining of the sinus. Even if a sphenoid sinus is opacified by inflammation, the cortical margins of the affected sinus should be intact. Loss of the cortical margin with an accompanying opacified sphenoid sinus is an indication for tomograms of the sphenoid sinus to assess possible bone destruction.

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